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## SECTION 1 OBJECTIVES AND INTRODUCTION

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### COURSE OBJECTIVES

At the completion of the Laboratory Spill Response course, the attendee will be able to:

- Explain the difference between a work area laboratory spill response and a HAZWOPER spill response.
- Identify the initial response actions required when a spill occurs.
- List the methods used to identify a hazardous material and the associated hazards.
- Identify the key factors necessary to the selection of personal protective equipment.
- Identify the types of personal protective equipment available at the NHMFL for spill clean-up and when they should be used.
- Demonstrate the techniques available to contain, control, and clean up spills at the laboratory.
- Explain the level of decontamination required for laboratory spills and the methods available.
- Describe the appropriate procedure for handling hazardous waste generated during a spill clean up.
- Identify the appropriate contacts at the NHMFL for reporting spills.

N O T E S :

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## SECTION 1 OBJECTIVES AND

- NOTES :

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**SECTION 2 INITIAL RESPONSE**

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## SECTION OVERVIEW

The initial response of a laboratory worker to a chemical spill is critical to the success of the clean up.

The first step of the initial response is to address personnel safety. If the spill has contaminated laboratory personnel, their well being must receive primary attention. If appropriate, wash affected areas under a safety shower and remove contaminated clothing. Move the exposed person to a safe area. Notify the NHMFL Safety Department of the exposure and summon medical attention if necessary.

If no one is contaminated or exposed to the spill, immediately secure the area around the spill. This should be done to ensure that no other workers inadvertently enter the area and are contaminated or exposed. Controlling access ensures that no one will walk through the material. Securing the area can be accomplished by posting barrier tape around the spill area or controlling access to the room through a doorway. If there is more than one entrance to the work area, obtain assistance and assign responsibility for controlling access through each of the entrances.

If the spill involves a flammable liquid such as acetone, eliminate sources of ignition in the spill area.

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## SECTION 2 INITIAL RESPONSE

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## SECTION OVERVIEW

Recognizing the type and degree of chemical hazard present is the first step in assessing risk and controlling it on a systematic basis. The hazardous substances present must be identified and their physical and chemical properties determined in order to predict the behavior and risk associated with the material. Some laboratory work areas may involve only one or two hazardous substances and identifying them can be a fairly simple matter. However, the NHMFL chemistry laboratories may have hundreds of different substances; identifying those involved in a spill may be very difficult. Possible sources of information during a spill include package labeling, markings and colors, the NFPA Hazard Identification System, the DOT Hazard Class System, shipping papers and documents, and senses.

***DOT is the U.S. Department of Transportation.***

### SECTION 3 IDENTIFICATION OF THE

[illegible]

## LABELING

A number of gases at the NHMFL are stored and transported in compressed gas cylinders. Although there are several voluntary color schemes for identifying cylinder contents, none are mandatory. **The only reliable way to identify cylinder contents is to check the attached label.**

## MARKINGS/COLORS

Identifiable container markings and colors can provide valuable information if used correctly. The most important marking on any container is the name of the contents. Many chemicals in use at the laboratory are identified by their trade names, not the chemical name. If only the trade name is known, additional information about a substance may be found on an MSDS.

## NFPA 704M HAZARD IDENTIFICATION SYSTEM

Special Information (WHITE)

The white block is designated for special information about the chemical. For example, it may indicate that the material is radioactive by displaying the standard radioactive symbol, or unusually water-reactive by displaying a large W with a horizontal slash through it.

NOTES:

[illegible]

### SECTION 3 IDENTIFICATION OF THE MATERIAL/HAZARDS

NFPA HAZARD IDENTIFICATION SYSTEM

TABLE 3-1

NFPA HAZARD IDENTIFICATION SYSTEM

Hazard	Ranking	Description	Examples
Health (Blue)	4	Materials that on very short exposure could cause death or major residual injury even though prompt medical treatment is given.	Acrylonitrile Bromine
	3	Materials that on short exposure could cause serious injury on a temporary or residual basis though prompt medical treatment is given.	Sodium hydroxide Sulfuric Acid
	2	Materials that on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.	Pyridine Styrene
	1	Materials that on exposure would cause irritation but only minor residual injury even if no treatment is given.	Acetone Methanol
	0	Materials that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.	
Fire (Red)	4	Materials that (a) rapidly or completely vaporize at atmospheric pressure and normal ambient temperatures and burn readily or (b) are readily dispersed in air and burn rapidly.	1,3-Butadiene Propane Ethylene oxide
	3	Liquids and solids that can be ignited under almost all ambient temperature conditions.	Phosphorus Acrylonitrile
	2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.	2-Butanone Kerosene
	1	Materials that must be preheated before ignition can occur.	Sodium Red phosphorus
	0	Materials which present no fire hazard.	

NOTES :

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### SECTION 3 IDENTIFICATION OF THE MATERIAL/HAZARDS

TABLE 3-1

NFPA HAZARD IDENTIFICATION SYSTEM  
(Continued)

Hazard	Ranking	Description	Examples
Reactivity (Yellow)	4	Materials that in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.	Benzoyl peroxide TNT
	3	Materials that (a) in themselves are capable of detonation or explosive reaction, but require a strong initiating source or (b) must be heated under confinement before initiation or (c) react explosively with water.	Diborane Ethylene oxide 2-Nitropropadene
	2	Materials that (a) in themselves are normally unstable and readily undergo violent chemical change, but do not detonate or (b) may react violently with water or (c) may form potentially explosive mixtures with water.	Acetaldehyde Potassium
	1	Materials that in themselves are normally stable, but which can (a) become unstable at elevated temperatures or (b) react with water with some release of energy but not violently.	Ethyl ether Sulfuric acid
	0	Materials that in themselves are normally stable, except when exposed to fire, and that do not react with water.	

NOTES :

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## NOTES :

*Note: Never remove DOT labels from shipping containers or packages.*

*Note: For a copy of the DOT Emergency Response Guidebook, contact the NHMFL Safety Department.*

**DOT HAZARD CLASS SYSTEM**

The Code of Federal Regulation, Part 49 (49 CFR), outlines the Department of Transportation (DOT) hazardous materials labeling requirements for commercial transportation between states. The Hazardous Materials Transportation Administration of the DOT requires labels on small containers (non-bulk containers less than 110 gallons). These labels must be present on DOT shipping containers and packages found in the laboratory.

DOT labels are 4 inches square and are applied to individual hazardous materials packages. They are generally found near the contents name or are printed on the manufacturing label. When DOT labels cannot be applied directly to the container because of a nonadhesive surface, they are placed on tags or cards attached to the package.

The DOT label displays a color, a symbol, and a United Nations hazard class number. There are a total of 9 DOT hazard classes. Table 3-2 provides a breakdown of the various hazard classifications found on DOT labels.

Although classified by DOT as a package/container marking, the four-digit United Nations (UN) identification number may be present on cases used to package multiple bottles of solvent or corrosives. The DOT "Emergency Response Guide Book" can be used to cross reference UN numbers with chemical names.

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**SECTION 3 IDENTIFICATION OF THE MATERIAL/HAZARDS**

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The proper DOT label(s) are determined by the product's hazard class. Some chemicals have more than one hazard, so multiple labels may be required. For example, concentrated nitric acid found at the NHMFL may be labeled as "CORROSIVE" and "OXIDIZER."

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## NOTES :

**SHIPPING PAPERS AND DOCUMENTS**

Should your laboratory receive a package that is leaking, immediately contact the Shipping Department for assistance. The shipping documents accompanying the package can be a very important source of chemical information. Although various terms are used for shipping papers, such as "bill of lading," all such papers contain the same basic entries, including:

- Proper shipping name according to DOT regulations.
- Hazard classification according to DOT regulations.
- Four-digit identification number(s), as required.
- Type of packages (container, boxes, cylinders, etc.).
- Total quantity by weight, volume and/or packaging.

Shipping papers may also include the following entry:

If the lading is a poison and that fact is not obvious from the proper shipping name, the word "POISON" and/or the technical name of the poison must be displayed near the shipping name. When the lading poses an inhalation hazard, "POISON-INHALATION HAZARD" must appear.

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## SECTION 3 IDENTIFICATION OF THE MATERIAL/HAZARDS

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### SENSES

The human senses are valuable assets and can offer immediate clues to the presence of hazardous materials, so the senses should never be ignored, but they should be used cautiously. For our purposes, "senses" refers to any personal physiological reaction to or visual observation of the release of a hazardous material. Smells, dizziness, unusual noises (e.g., hissing containers), or sights (e.g., fuming liquids) are some examples.

It is very difficult to teach people to identify correctly clues based on human sensory perception because of differing individual physiological reactions to the same substance. The large number of hazardous materials and perceptual differences caused by variations in amounts released adds to the difficulty. For example, one chemical may have identifying characteristics that a second material in the same chemical family does not have, even though they are both equally hazardous. Other chemicals have characteristics that can be insidiously misleading. Hydrogen sulfide, for example, can deaden the sense of smell and lead workers to believe they are operating in a safe environment when they are not.

Sense of smell can be used as an indicator of potential exposure if the odor threshold and the OSHA Permissible Exposure Limit (PEL) are known. If the odor is distinct and the threshold below the PEL, then odor can be used as an initial qualifier when determining if it is safe to respond to a spill without respiratory protection. Table 3-3 provides examples of odor thresholds, PELs, and characteristic odor for chemicals typically found at the NHMFL.

### NOTES :

***Note: Do not intentionally smell chemicals for the purpose of identification.***

### SECTION 3 IDENTIFICATION OF THE

[illegible]

# ODOR THRESHOLDS AND EXPOSURE LIMITS FOR CHEMICALS FOUND AT THE NHMFL

Chemical Name	Odor Threshold (PPM)	OSHA Permissible Exposure Limits (PPM)	Characteristic Odor
Acetic Acid	0.074	10	Pungent
Acetone	150	1000	Sweet, fruity
Acetonitrile	1160	40	Etherish
Benzene	61	1	Aromatic, sweet
Ethyl Alcohol	10	1000	Sweet, alcohol
Isopropyl Alcohol	43	400	Rubbing alcohol
Methyl Alcohol	53	200	Sour
Methylene Chloride	160	500	Sweet
Toluene	1.6	200	Sour, burnt
Xylene	20	100	Sweet

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## SECTION 3 IDENTIFICATION OF THE MATERIAL/HAZARDS

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The American Industrial Hygiene Association publishes a list of odor thresholds called "Odor Thresholds for Chemicals with Established Occupational Health Standards".

Except for vision, the senses are not a primary identification tool. In most cases, if a worker is close enough to smell, feel, or hear a problem, the worker is probably too close to work safely.

### UNKNOWN S

In the event that the material spilled in your laboratory is unknown, you should:

- Evacuate all workers from the area.
- Secure the area so no one else can enter.
- Notify the NHMFL Safety Department.
- Provide the NHMFL Safety Department with any information you may have on the spill and the conditions in the laboratory (ventilation, ignition sources, etc.).

N O T E S :

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## SECTION 4 PERSONAL PROTECTIVE EQUIPMENT

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### SECTION OVERVIEW

Selection of the appropriate PPE is critical to the protection of worker's cleaning up spills. PPE must be purchased and stored in your work area prior to the spill occurring. This involves planning and determining ahead of time what PPE will be necessary to clean up the spill. Laboratory workers must receive training on the use and limitations of PPE prior to responding to a spill.

The method by which a hazardous material can compromise the integrity of chemical protective equipment depends upon the material's physical, chemical, and toxicological properties.

Laboratory workers must protect themselves from these properties or they take the risk of being exposed. Harm could range from simple irritation of the eyes for a short period of time to long-term illness, cancer, or sudden death. This section will provide the basic information needed during a hazardous materials spill to make appropriate decisions concerning safety gear. The following is a discussion on selection and general use of personal protective equipment and respirators used during laboratory spills.

### PRELIMINARY CONCERNS

To adequately protect laboratory personnel, it is necessary to learn as much as possible about the particular spill material(s) of concern. It is important to ascertain:

- The identity and quantity of the material(s) present. If more than one material is present, the products of any reaction.

### NOTES :

*Note: MSDS provide information on specific PPE requirements.*

## NOTES :

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Available NHMFL Reference Books

*Chemical Condensed Dictionary*  
*Merck Index*  
*Code of Federal Regulations*  
*Hazardous Chemicals Desk*  
*Reference*

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*Note: Some hazardous chemicals do not have a noticeable odor.*

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- The physical state of the material(s), i.e., liquid, vapor, gas, solid, or combination.
- The material's interaction with surfaces contacted.
- The duration of possible exposure during the spill clean up.
- The routes of entry by which the material can enter the body.
- The warning properties, early symptoms and possible delayed or desensitizing effects of an exposure.
- Other pertinent factors such as the probability that a fire, explosion, or violent reaction may occur while you are in close proximity to the material.

All of this information is often available from background information, including MSDS and reference books.

**RESPIRATORS**

Respirators provide protection for the inhalation route of entry. If a spill in your work area requires the use of respiratory protection, you should evacuate the area and contact the NHMFL Safety Department. There are two methods available to laboratory workers to determine the need for respiratory protection. The first method is the use of odor threshold as described in Section 3. The second method is prior knowledge of the

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## SECTION 4 PERSONAL PROTECTIVE EQUIPMENT

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chemical. Laboratory workers must know if a chemical releases hazardous vapors when spilled. This can only be accomplished through a detailed understanding of the chemicals you work with and their physical properties. Refer to the MSDS for information on respiratory protection requirements.

The use of respirators is regulated by OSHA and requires training, medical examinations, and fit-testing.

### CHEMICAL PROTECTIVE CLOTHING

Chemical protective clothing shields against the direct contact route of entry. There is no universal protective garment, that is, no one material provides the best, or even adequate, protection against all chemicals and in all situations. For this reason, many manufacturers are developing or have developed multi-layer fabrics. This layering may tend to increase the stiffness of the complete fabric which reduces the dexterity and agility of the wearer. The advantage of multi-layer fabric is that it can provide an increased level of protection. Different types of chemical protective clothing used at the NHMFL will be shown by your instructor.

#### Selection of Protective Clothing

The NHMFL Safety Department will assist with the proper selection of PPE for specific jobs. Personal protective equipment shall be made available prior to performing any work requiring its use.

The types and amounts of protective clothing will vary with each individual case. Some of the articles available at the laboratory include:

- Boot protectors (booties)
- Gloves

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## SECTION 4 PERSONAL PROTECTIVE EQUIPMENT

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N O T E S :

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***Note: Never wear a respirator unless you have received the proper training.***

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**EQUIPMENT**

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**SECTION 4 PERSONAL PROTECTIVE****NOTES :**

- Splash goggles
- Splash shields
- Chemical protective aprons

Table 4-1 describes functions of various pieces of protective gear.

TABLE 4-1

## PROTECTIVE EQUIPMENT USED AT THE NHMFL

EQUIPMENT TYPE	FUNCTION
Boot Protectors	Made of a variety of materials. Inexpensive. Slip over shoe or boot. Protects work shoes/boots from contamination. Disposable covers allow for quick decontamination.
Gloves	Protects hands and forearms from chemical contact. There are many glove materials. Need to know glove compatibility with specific chemical.
Splash Goggles	Depending on their construction, goggles can protect against vaporized chemicals, splashes, and large particles.
Splash Shield	Provides full face coverage. Protects against chemical splashes. Face shields must be suitably supported to prevent them from shifting and exposing portions of the face.
Chemical Protective Apron	Apron made of chemically protective material. Provides additional splash protection of chest. When possible, should be used over a laboratory coat. Useful for spill clean up. Should be used only when there is a low probability of total body contact.



## NOTES :

**Penetration** occurs through a physical hole in the protective layer. Points of penetration include unsealed seams, porous spots, as well as tears, rips, or punctures. Penetration can be remedied by a regular inspection program to detect damage and by physical hazard aversion. Leather work gloves over chemical resistant gloves can be used to prevent penetration.

**Permeation** can be described as the tendency of a chemical to reach equilibrium once a concentration gradient has been established across the fabric of the chemical protective gear. The rate at which the chemical permeates through the material is referred to as the permeation rate. Permeation can be reduced by avoiding unnecessary contact with chemicals. Once a compound permeates a material, it usually remains in the material until it evaporates or is removed by thorough decontamination. Often, permeation results in a garment that is impossible to decontaminate, and thus the garment must be disposed of.

In addition to chemical resistance, **physical compatibility** of the protective garment must be considered. For example, polyvinyl alcohol (PVA) has good to excellent resistance to a large variety of chemicals. It has good resistance to heat and tears and is fairly resistant to punctures, cuts, and abrasion. Unfortunately, this material is soluble in water. Another example of incompatibility is diethylamine, which attacks the polycarbonate lens used in goggles, safety glasses, and face shields. The reaction causes the lens to become extremely brittle and to shatter at the slightest stress.

## CHOOSING YOUR PROTECTION

**Hazards:** The physical form of the potential contaminant must be considered. Airborne substances are more likely to be inhaled or contact the skin. Skin contact and contamination of laboratory coats and street clothing can be avoided by wearing chemical protective suits.

- Highly hazardous substances are those that are easily absorbed through the skin, causing systemic effects or causing severe skin destruction.
- Less hazardous substances are those that are not easily absorbed through the skin to cause systemic effects, or that do not cause severe skin destruction.
- Contact time also effects the degree of damage to the skin. The longer the material contacts the skin, the more likely it is to damage the skin.

**Risks:** Concentration of the contaminant: The higher the concentration, the higher the probability of injury.

NOTES:

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SECTION 4 PERSONAL PROTECTIVE EQUIPMENT	
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**Work function:** Clean up activities dictate the probability of direct and indirect skin contact.

In situations where the type of chemical, concentration, and possibility for contact are not known, or where the proper PPE is not available, laboratory workers must notify the NHMFL Safety Department for assistance with the spill. The safety department will make the determination if adequate resources exist within the laboratory to respond to the spill or if an outside agency (Fire Department Hazardous Materials Team) must assist with the response.

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## SECTION 5 SPILL CONTAINMENT/CONTROL/CLEAN UP

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### SECTION OVERVIEW

This section provides a brief overview of several techniques that are designed to be utilized within short periods of time with equipment and materials readily available to the laboratory worker. This section specifically addresses chemical spills in NHMFL chemical laboratories and other work areas where small quantities of hazardous materials are used.

Response to spills in the laboratory can be broken down into three phases; containment, control, and clean up.

### CONTAINMENT

Containment is prevention of the spread of hazardous materials from the site of the spill. This is usually accomplished by using a physical barrier to contain the material to the spill area. If the spill cannot be approached and the material is spreading, the barrier can be established downgrade from the spill. This will contain the material once it reaches the barrier. Barriers should also be established around floor drains to prevent hazardous materials from entering the drains. A spill of a flammable material such as acetone or hexane into a drain could result in a serious explosion if an ignition source is present. Sink drains should also be guarded from hazardous materials if the spill occurs on a laboratory bench top.

### NOTES :

#### Examples of Containment Devices

*Pads*  
*Socks*  
*Booms*  
*Absorbents*  
*Drain Covers*  
*Plastic*

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**SECTION 5 SPILL CONTAINMENT/CONTROL/CLEAN UP**

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Containment of a spill is needed to ensure protection of laboratory personnel, property and the environment. The more efficient the containment, the greater the protection. The advantages of prompt containment of hazardous materials spills are:

- Minimizes damage to laboratory property.
- Minimizes opportunity for contaminant to reach a floor or sink drain, and leave the facility.
- Prevention of dispersion of the contaminant, thus decreasing the potential for worker exposure and reducing cleanup costs.

Weighted drain covers and absorbent socks or pillows are the items most commonly used to contain a spill or prevent it from reaching a sensitive receptor (floor drain).

Some chemicals, such as ethyl ether, are extremely volatile and evaporate very quickly. When spills of extremely volatile chemicals are contained to the inside of a laboratory hood, allowing the material to evaporate is a response that should be considered.

Each hazardous materials spill is unique, so no hard and fast rules are possible. However, techniques using weighted drain covers and absorbent socks or pillows for reducing the migration of contaminants have been successful. These techniques can be used as stop-gap measures to reduce migration of contaminants until other aid can arrive, or, if

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## SECTION 5 SPILL CONTAINMENT/CONTROL/CLEAN UP

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situation warrants, to provide adequate cleanup of situations that the laboratory workers at the scene know can be handled safely with available equipment. In order to determine the best method of containment using the available resources, the clearest assessment possible of the situation must be made. At a minimum, this assessment should include: identification of all involved materials; the physical properties of the materials being released (specifically vapor density, vapor pressure, specific gravity, flashpoint, compatibilities, reactivities, boiling point, and solubility); and the conditions in the laboratory (floor drains, ventilation systems, etc.).

### CONTROL

The control phase of a spill response involves stopping an ongoing spill or leak. In the laboratory environment, this may include tightening the cap on a container that was tipping over to stop the leak or turning a can containing a liquid upside down to prevent leakage along the bottom of the container.

Leaking containers can also be controlled by overpacking in larger containers. When overpacking, it is critical to select an overpack container that is compatible with the leaking material. The overpack container should be filled with a compatible absorbent material.

If you have a leaking container and must transfer the liquid to another container, be aware that a static electricity charge can build up from the movement of the liquid against the sides of the container. This charge can act as an ignition source in the case of flammable liquids. Containers should be grounded whenever a

### NOTES :

*If you need to transfer a flammable liquid to another container, contact the NHMFL Safety Department for assistance.*

## NOTES:

## CLEAN UP

## Liquid Spill Clean Up

There are both advantages and disadvantages to the use of absorbents.

Advantages:

- Very easy to use; materials readily available.
- Some absorbents can reduce the hazard.

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## SECTION 5 SPILL CONTAINMENT/CONTROL/CLEAN UP

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### NOTES :

*Note: Avoid creating airborne dusts.*

2. After the material has been completely absorbed, scoop the material into a plastic bag. Then place the scoop into the bag and seal the bag with a wire tie. Label the bag with the contents, date, and your name, and contact the NHMFL Safety Department for removal of the waste.
3. The next step is to decontaminate the affected area. The decontamination process is detailed in Section 6.

Fabric spill pillows are also available in the laboratory and are an alternative to the SPILL-X absorbents for absorbing small spills. Spill pillows should only be used on aqueous liquids that are not corrosive or flammable. It is critical to ensure that the spill pillow is compatible with the spilled material.

Manufacturers will list the types of chemicals compatible with their pillows. Never use fabric pillows on a hydrofluoric acid spill. Special pillows have been developed which are compatible with hydrofluoric acid.

Mercury spills at the NHMFL require special clean up procedures. The NHMFL Safety Department has a mercury spill kit and is trained in the clean

### **SOLIDS SPILL CLEAN UP**

up of mercury spills.

Spills involving solids in a laboratory will generally include solid chemical reagents. Solid chemical reagents are not necessarily inert. Solids can be

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## SECTION 5 SPILL CONTAINMENT/CONTROL/CLEAN UP

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corrosive (sodium  
hydroxide and ammonium  
hydroxide pellets) or a  
poison (mercuric chloride  
or

potassium cyanide). Therefore, extreme care must be taken to prevent exposures by the inhalation, ingestion or absorption routes of entry.

Solids spilled on the floor or bench tops should be cleaned up as soon as possible. This is important to ensure that the material is not spread throughout the work area. Generally, plastic scoops work best. A dust pan and brush are also useful in the laboratory for clean up of solid materials. The use of brooms, brushes or shop vacuums is to be avoided if the material is toxic. Typical shop vacuums do not have filters capable of removing very small particles. The use of a shop vacuum could cause the material to become airborne resulting in worker inhalation exposures and dispersion of the material. Avoid the generation of airborne particulates when cleaning up a spill. If you expect that the material will become airborne and respiratory protection will be needed, contact the NHMFL Safety Department immediately. The safety department has personnel trained in the use of respiratory protection who can safely respond to the spill.

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## SECTION 6 DECONTAMINATION

## SECTION OVERVIEW

After the spill has been cleaned up, both you and the affected surfaces may require decontamination. Decontamination is the process of removing contamination from personnel, protective clothing, equipment, and work surfaces to prevent the spread of hazardous materials and the associated risk of exposure.

## HOW DO PERSONNEL BECOME EXPOSED

A person may become contaminated when hazardous materials enter the body through one of the following routes of exposure:

## Inhalation

- Contact with vapors, gases, or particulates in air may allow contaminants to enter the respiratory system.
- Removal of contaminated clothing may generate vapors in the breathing zone around the nose and mouth.

## Direct Contact/Absorption

- Contact with hazardous materials may permit contaminants to penetrate protective clothing.
- Involvement in a hazardous materials incident may allow vapors to penetrate clothing and skin tissue.

NOTES:

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## Ingestion

## Injection

## PREVENTION OF CONTAMINATION

### Prevention of inhalation of hazardous materials:

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## SECTION 6 DECONTAMINATION

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### Prevention of direct contact/absorption of hazardous materials:

- Minimize personal contact with the hazardous material. Do not walk through puddles or spills.
- Use remote clean up tools such as plastic scoops to prevent contact with protective clothing
- Use splash aprons to minimize contamination during clean up. They can be easily removed, and decontaminated and packaged for disposal.

### Prevention of ingestion of hazardous materials:

- Keep food and beverages out of chemical handling areas. Be sure to wash your hands and face after cleaning up the spill.

### Prevention of injection of hazardous materials:

- Exercise care near broken glass and other sharp objects. Many types of chemical protective clothing are easily penetrated by sharp objects. The protection of chemically-resistant materials is good only as long as the materials are not punctured or torn.

## **METHODS OF DECONTAMINATION**

The decontamination method selected depends on the type of material that has been spilled. MSDS and chemical reference books can provide information on the selection of an

appropriate method. The method of decontamination

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Both the physical nature and toxicity of contaminants must be considered when choosing the appropriate decontamination methods. Utilizing soft-bristle brushes to wash with a mild detergent solution, followed by rinsing with water is the most common form of decontamination. However, the method chosen should be based on specific spill conditions. The following are the three most commonly used decontamination methods.

## Advantages

- Readily available at most laboratory locations.
- Will not generate toxic fumes.
- Safe for personnel, protective gear, work surfaces and equipment.

### Disadvantages

- Reduces contamination, but does not change chemical makeup.
- Complications with soluble compounds.
- Creates large amounts of potentially hazardous waste.
- Material must be soluble in the cleaning solution.

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## SECTION 6 DECONTAMINATION

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## SECTION 6 DECONTAMINATION

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- Chemical Degradation** - The altering of the chemical structure of a contaminant to make it less hazardous.

- Can permanently reduce the effects of a hazardous material.
- Can limit cleanup costs.
- Remaining material may be non-hazardous.

- Should not be used directly on personnel.
- Requires chemical expertise.
- May produce other types of hazardous materials.

**Neutralization** - The introduction of another chemical to cause a chemical reaction, resulting in a less hazardous product.

- Can eliminate the original hazardous properties of a material.
- Common neutralization materials are often readily available.

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- Will result in some form of heat exchange, sometimes posing an additional risk.
- Decontamination reagents may be hazardous.
- May give off toxic gases.

The equipment available for decontamination will vary depending on the laboratory and the types of chemicals handled in the laboratory. Below is a list of equipment recommended for use in decontamination:

- Wash solutions, generally industrial strength detergents and water used on work surfaces and equipment.
- Rinse solutions to remove contaminants and contaminated wash solutions.
- Soft-bristle brushes to help wash and rinse off contaminants from work surfaces, gloves, and booties.
- Paper or cloth towels for drying protective clothing, work surfaces, and equipment.
- Collection containers, such as drums or lined trash cans, for storing disposable contaminated personal

protective  
clothing,  
paper towels  
or equipment.

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## SECTION 6 DECONTAMINATION

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- Containers to hold wash and rinse solutions for characterization prior to disposal.

## DECONTAMINATION OF WORK SURFACE

Work surfaces must be thoroughly cleaned after removing the gross contamination during spill clean up and prior to reuse. Soft-bristle brushes and soap and water are the most typical method for cleaning work surfaces. Care must be taken to contain all wash and rinse water to the affected areas only. When possible, limit the volume of waste being generated, including liquids (wash and rinse waters) and solids (paper towels, sponges, brushes).

## DECONTAMINATION OF PROTECTIVE CLOTHING

**Expendable** - Those pieces of protective gear which can be discarded should be decontaminated prior to disposal. Special disposal bags should be set aside for disposal of these materials. Final disposal must be arranged through the NHMFL Safety Department.

**Non-expendable** - Clothing which will be reused must not only be decontaminated, but also sanitized.

- Instructions for sanitization by clothing manufacturer must be followed.
- Permeability and shelf-life data must be recorded.

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- Seams must be thoroughly scrubbed.
- After cleaning, reusable protective clothing must be leak-tested according to the manufacturer's instructions.

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**SECTION 7 DISPOSAL OF CONTAMINATED MATERIAL**

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## SECTION OVERVIEW

In the course of cleaning up a spill, waste materials such as absorbents, neutralizers, spill pillows, paper towels, etc. will be generated. This waste may be classified as hazardous waste depending on the material that is spilled. Laboratory workers must segregate waste as it is generated during the clean up. Waste should be collected in compatible containers, in most cases plastics bags will be appropriate.

The NHMFL Safety Department will provide guidance concerning the disposal of the waste. The laboratory worker will need to provide the NHMFL Hazardous Material Manager with information concerning the contents of the waste and concentration of the contaminants. This information is required to ensure that the waste is properly characterized prior to transport and disposal.

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## SECTION 8 SPILL REPORTING

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### SECTION OVERVIEW

All spills must be reported to the NHMFL Safety Department by telephone after clean up. This is important to ensure that you have not been exposed or injured, and that the spill has been cleaned up in a manner that does not present future harm to NHMFL workers or the environment.

Minor spills which are handled quickly are considered near miss accidents and may be an indication of potential for more significant incidents. Reporting these minor spills to the NHMFL Safety Department will provide information regarding trends in the laboratory and where remedial actions should be taken, such as modification of work practices, additional training on chemical handling and storage, and spill response.

### NOTES :

#### Spill Reporting Contacts

**Safety Coordinator**  
**644-0233 (Office)**  
**65708278 (Pager)**

**Hazardous Materials Manager**  
**644-6955 (Office)**  
**657-8279 (Pager)**

## SECTION 9 SUMMARY

In this program, we have reviewed:

- The differences between small scale laboratory spills and spills requiring assistance from a spill team.
- The initial response actions to be taken in the event of a spill.
- How to identify a hazardous material.
- Selection of PPE.
- Techniques to contain, control, and clean up spills.
- Decontamination required for laboratory spills.
- Procedures for handling hazardous waste generated as a result of laboratory spills.
- Reporting requirements for laboratory spills.

The information presented in this program is designed to reduce the potential for injuries, illness or property damage in the event of a spill. If you have any questions concerning laboratory spill response, contact the NHMFL Safety Department.

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